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APPARATUS FOR SPREADING, LEVELLING AND COMPACTINGPARTICULATE MATERIAL IN TRENCHES**TECHNICAL FIELD**

- The present invention relates to apparatus for use in embedding pipelines
5 or similar elongate conduits or members in preformed trenches.

TECHNICAL BACKGROUND

It is conventional practice when laying a pipe line or the like underground to form a trench extending in the required direction and at the required depth. A fine particulate bedding material is then laid in the base of the trench. This
10 bedding material may be said or similar delivered to the site or it might be fine particulate material prepared from the material excavated from the trench. In either case, the material may be dropped into the trench at spaced locations by a front end loader or the like with the material then being spread and levelled by various means such as manually by workmen with shovels or perhaps by
15 dragging a chain along the base of the trench. Once the bedding material has been spread and levelled, the pipeline (or similar) is laid thereon and subsequently further fine particulate material is placed around and over the pipeline (or similar). Once this process has been completed, the trench is back filled with normal earth, rock etc previously excavated from the trench. It is
20 desirable that the sand or similar particulate material be relatively evenly packed or distributed about the pipeline as any significant gaps, openings or cavities may cause undesirable loadings on the pipeline wall.

Machinery is also known from prior art documents that will excavate trenches and undertake at least some of the foregoing steps by operation of one
25 or more machines, however, such machinery is generally complicated and quite expensive. There is therefore a need for apparatus that will assist in the speed and effectiveness of a manual or semi manual operation utilising simple equipment such as front end loaders or the like that would normally be readily available at a trench forming and pipe laying site, without the need to use
30 expensive and complicated purpose built machines.

The present invention therefore aims at providing apparatus usable in applications of the above discussed type that will, in a relatively simple and effective manner, distribute and level particulate material in the base of the trench

and/or ensure the particulate material around and, if provided, above the pipeline (or the like), is uniformly packed such that significant gaps or cavities are not left in the material.

INTRODUCTION OF THE INVENTION

- 5 According to a first aspect of the invention, there is provided apparatus for compacting fine particulate earth or sand material around an elongate member laid in a trench, said apparatus including at least one disc member having a plurality of teeth like formations around its periphery and mount means for said at least one disc member permitting said disc member to roll through said fine
10 particulate material in said trench, said mount means including connection means enabling said apparatus to be connected to machinery for moving the apparatus along said trench.

Preferred features of the aforesaid aspect may be as defined in claims 2 to 4 annexed hereto, the subject matter of these claims being included in the
15 disclosure of this specification by this reference thereto.

- According to a second aspect of this invention there is provided equipment for spreading and levelling fine particulate earth or sand material already deposited in the base region of a preformed trench, said equipment including a pair of laterally spaced side walls supported by skid members adapted, in use, to
20 be positioned on a base surface of the trench, each said skid member extending generally in line with the direction of the trench and being located adjacent a side wall of the trench, said equipment including cross brace means for maintaining spacing of said side walls during use, wall means closing a cross-sectional zone of said equipment between said side walls having a lower edge adapted to
25 provide a level surface to said fine particulate material spread by said wall means, and connection means enabling said equipment to be connected to machinery for moving the equipment along said trench supported on the base of said trench.

Preferred features of this second aspect may be as defined in claims 6 to 8 annexed hereto, the subject matter of these claims being included in the
30 disclosure of this specification by this reference thereto.

In accordance with a third aspect, the present invention provides a method of laying and embedding a pipeline or similar elongate member in a trench, said method involving the steps of:

- (i) depositing fine particulate bedding material into the trench for use as bedding under the elongate member;
- (ii) placing first apparatus in the trench, said first apparatus having spaced side wall means supported by support means resting on a base of said trench with said side wall means located adjacent respective side walls of said trench, said first apparatus also including a transverse wall member having a lower edge spaced upwardly from the base of said trench;
- 5 (iii) moving said first apparatus along said trench while said transverse wall member spreads said fine particulate material and the lower edge of said transverse wall means provides a level surface for said fine particulate material;
- 10 (iv) laying said elongate member on said level surface of said fine particulate material;
- (v) depositing a further quantity of fine particulate material into said trench such that said further quantity at least partially fills the space between said elongate member and the side walls of the trench;
- 15 (vi) passing a second apparatus along said trench at least once, said second apparatus including at least one disc member having a plurality of teeth like formations around its periphery whereby the or each said disc member rolls through said fine particulate material on either side of said elongate member; and
- 20 (vii) back filling the trench.

Preferred features of this third aspect may be as defined in claims 11 to 14 annexed hereto, the subject matter of these claims being included in the disclosure of this specification by this reference thereto.

DESCRIPTION OF DRAWINGS

Preferred embodiments of this invention will now be described with reference to the accompanying drawings, in which:

Fig 1 is a schematic transverse view of a compactor apparatus according 30 to one aspect of the present invention in a position of use within a trench;

Fig 2 is a schematic side view of the compactor apparatus shown in Fig 1;

Fig 3 is a side view of preferred spreading and levelling apparatus according to a second aspect of the present invention;

Fig 3a is a plan view along line A-A of Fig 3; and

Figs 4 and 5 are respectively front and rear views of the apparatus shown in Fig 3.

MEANS OF PUTTING THE INVENTION INTO PRACTICE

- 5 Referring first to Figs 3 to 5, equipment 10 is illustrated for spreading and levelling fine particulate material, typically sand or the like, imported to the site of the trench 11 and deposited therein at spaced locations. The equipment 10 includes a pair of side walls 12, 13, each being supported on skid members 14 upturned at their forward ends 15 to facilitate sliding movement along the trench
- 10 11. The forward end of the side walls 12, 13 have upright members 16, 17 with plates 18 extending forwardly to enable pulling chains, bars or any other suitable means 19 to be connected thereto, selectively at adjustable heights. The pulling chains 19 may be connected to any suitable movable machinery to drag the equipment 10 along the trench 11 in the forward direction indicated by arrow 21
- 15 while the support skid members 14 remain on the base 22 of the trench. Typically, the moveable machinery might be a front end loader or similar that would be readily available. The equipment 10 includes a generally open front face 20, two or more intermediate cross brace members 23, 24, each being selectively adjustable so as to vary the transverse distance between the side walls 12, 13 to
- 20 enable adjustment for varying trench widths, and a rear wall member 25 that is also adjustable in width similarly to the cross brace members such that the equipment 10 might be varied in width to accommodate varying trench widths. The rear wall member 25 is also supported slidably in guides 26 at either side wall so as to be capable of adjustment in a vertical direction to raise or lower the
- 25 bottom edge 27 of the wall member 25. This vertical adjustment might be achieved by a winch 28 and cable 29 secured to the wall member 25, however, once vertical adjustment has been achieved, the wall member 25 is conveniently fixed in the desired position by bolts or similar passed through openings 30. The lower edge 27 of the wall member 25 may have a generally centrally located
- 30 downwardly formed protuberance 31 adapted to form a groove in the otherwise level surface 32 of the sand or similar fine particulate material squeezed beneath the edge 27 from the pile 33 of sand or similar fine particulate material pushed

along the trench by the wall member 25 as the equipment 10 is dragged along the trench 11.

Referring now to Figs 1 and 2, once sand or similar fine particulate material has been spread and levelled along the base 22 of the trench 11 using 5 equipment as shown in Figs 3 to 5, a pipeline 40 or similar elongate member can be positioned along the trench lying in the central groove 34 in the particulate material. Thereafter further sand or fine particulate surround material 41 and 42 might be positioned on either side of the pipeline 40 on top of the first laid bedding material such that the pipeline is held in its as laid position. It is, 10 however, desirable to ensure that there are no significant cavities around the pipeline once the trench has been completely back filled to avoid undesirable loading on the pipeline. To avoid such cavities, apparatus 50, shown in Figures 1 and 2 is used. The apparatus 50 preferably includes a pair of disc members 51, 52, each having teeth formations 53 around their periphery. In the illustrated 15 embodiment, the teeth formations 53 are square or rectangular in shape but other configurations are believed to also be useful. A central mount member 54 is provided which includes connection means 55, conveniently in the form of quick hitch ears or the like to enable interchange connection with the booms 56 of an excavator or front end loader. An adjustable length axle 57 passes through the 20 central mount member 54 and is rotatable relative thereto, the disc members 51, 52 being secured to the lateral ends of the axle 57. The adjustable length axle enables the spacing between the disc members 51, 52 to be varied to adjust for variable width pipelines / trenches. As has been shown in the drawings, each disc member 51, 52 might include cut out openings 58 to limit weight of the 25 apparatus. In use, a connected excavator or front end loader might move the apparatus 50 along the trench with the disc members 51, 52 rolling through the fine particulate material as illustrated to compact the material on either side of the pipeline. In this manner, any cavities that might exist are collapsed to provide a surround and bed of fine particulate material that is relatively uniform in density.

30 The spreading and levelling apparatus 10 may be fabricated from metal sections and metal sheets or plates in any known manner. Similarly the compactor device 50 may be made from metal plate and metal fillings of suitable strength and endurance capabilities. The spreading and levelling apparatus 10

is, in use, dragged along the base of a preformed trench 11 after sand or other similar particulate material has been deposited there in spaced piles. The particulate material is levelled in the trench by the lower edge 27 of the rear wall 25 as the apparatus 10 moves along the trench. At the same time a location 5 groove for the pipeline can be formed in the particulate material. The pipe line is then laid in the groove and subsequently further particulate material is deposited on the trench. The apparatus 10 is then moved along the trench again with the skids 14 moving on the first laid and levelled particulate material. This second pass of the apparatus 10 spreads and levels the particulate material on either 10 side and preferably above the pipe line. Subsequently, the compactor device 50 can be utilised moving along the particulate material in the trench to compact the material around the pipeline thereby avoiding dangerous cavities adjacent the pipe line.

Once the discs 51, 52 have performed their compacting effect, the trench 15 11 may be back filled with previously excavated trench earth material in the usual manner.